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None

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(54) Mine communication system

(57) A mine communication system comprises a control computer 10 for a plurality of mine roof supports 20, a plurality of control units 11 each associated with a respective roof support 20, the control units 11 being arranged so as to control and monitor the operations of the roof supports 20, at least one portable data unit 12 for use by an operator on the mine face, means for transmitting information from the support control computer 10 to the portable data unit 12 and means for transmitting information from the portable data unit 12 to the support control computer 10.

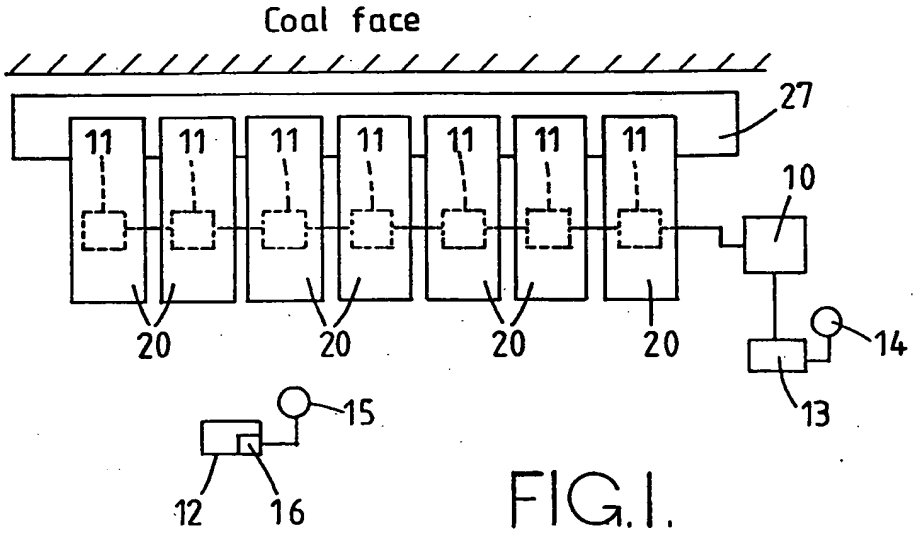

FIG.1.

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At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

The claims were filed later than the filing date within the period prescribed by Rule 25(1) of the Patents Rules 1990.

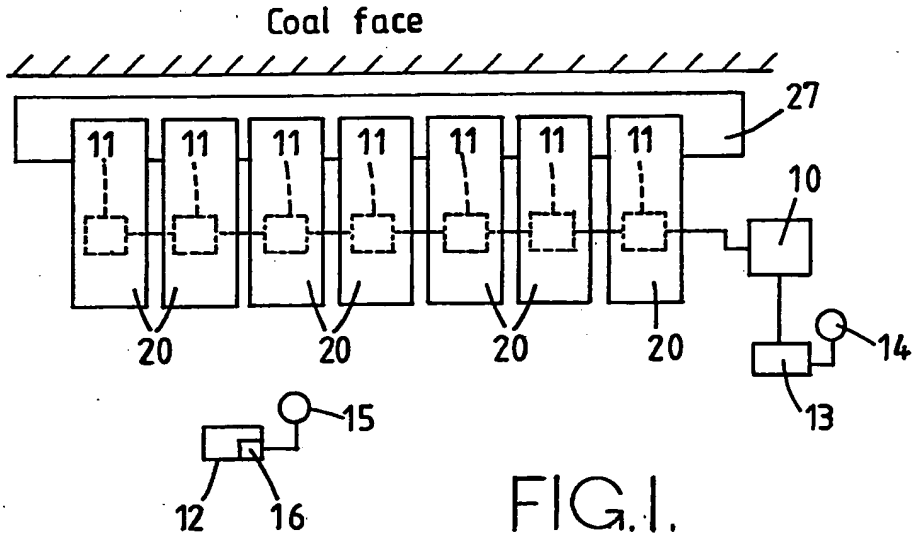

FIG.1.

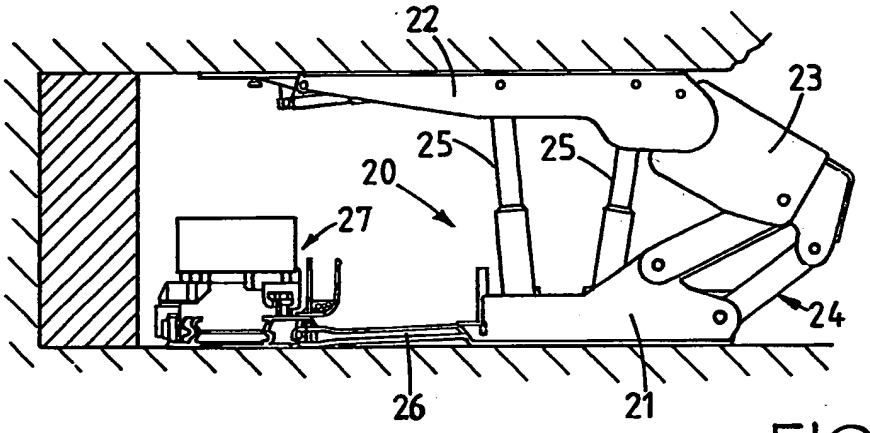

FIG.2.

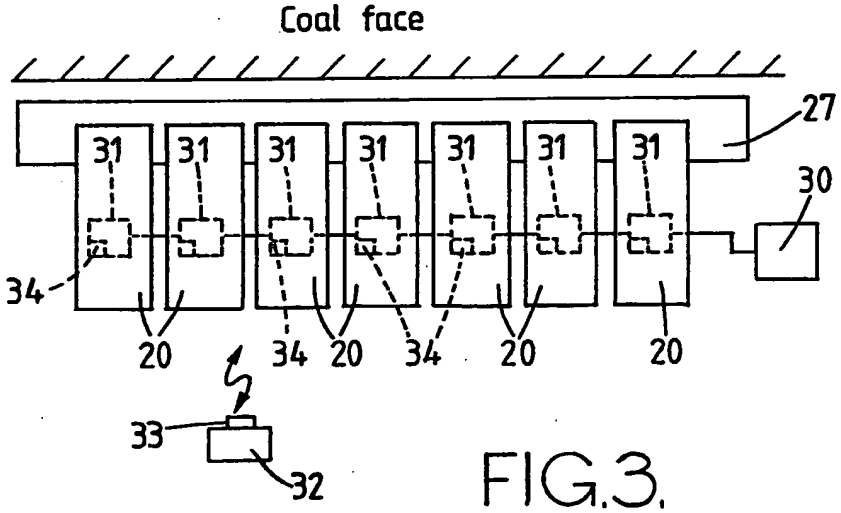

FIG.3.

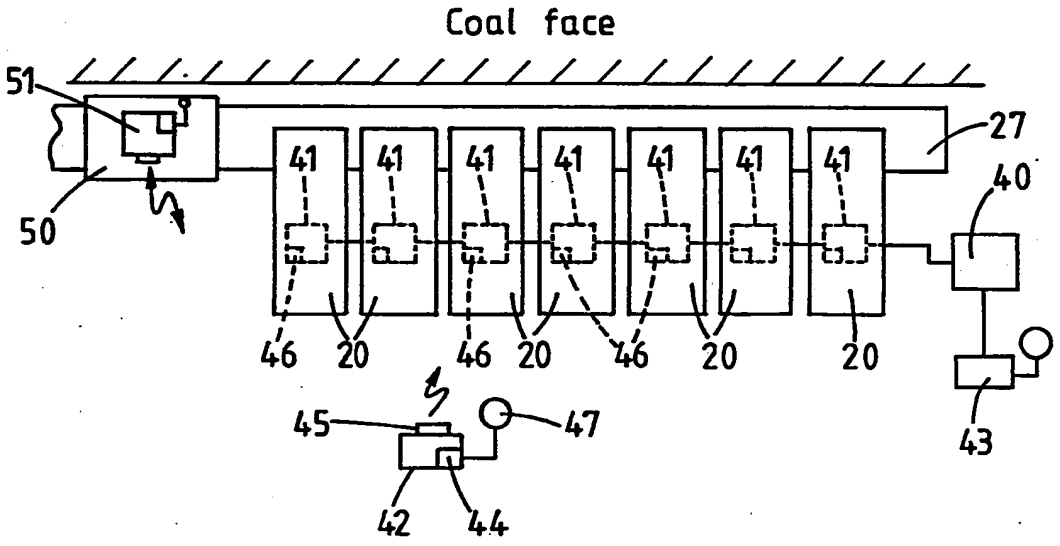
Coal face
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FIG 4.

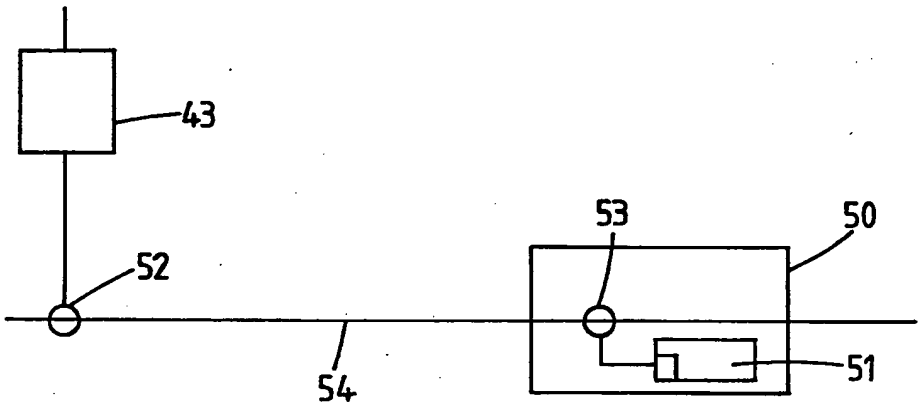
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FIG.5.

MINE COMMUNICATION SYSTEM

This invention relates to a mine communication system.

Modern longwall mining systems require more integration between the major elements such as the mineral winning machine, conveyor and roof supports in order to optimise the production process. Since these major elements are interdependent, faults on the system need to be rapidly and clearly communicated to operators. Furthermore, when faults occur, operators require ready means of corrective action without having to travel to various control stations to implement such action. Discrete systems provide local diagnostics either on the equipment itself or on the switchgear that powers the equipment. Integrating these discrete elements into a single system will allow all operational and diagnostic data to be provided at a central point.

According to the invention there is provided a mine communication system comprising a control computer for a plurality of mine roof supports, a plurality of control units each associated with a respective roof support, the control units being arranged so as to control and monitor the operations of the roof supports, at least one portable data unit for use by an operator

on the mine face, means for transmitting information from the support control computer to the portable data unit and means for transmitting information from the portable data unit to the support control computer.

Preferably, the communication system also comprises a further data unit on the mineral winning machine, means for transmitting information from the support control computer to the further data unit and means for transmitting information from the further data unit to the support control computer.

The information may be transmitted by radio link between the data unit and the control computer, or by infra red transmission between the data unit and an adjacent control unit, or by a combination of both. Indeed, in a preferred embodiment, information is transmitted from the control computer to the data unit by radio link and from the data unit to the control computer by infra red transmission between the data unit and an adjacent roof support control unit which in turn passes the signal to the control computer, such as by conventional wiring.

The mine communication system may also comprise a central computer to which the support control computer is linked.

The invention will now be more particularly described, by way of example, with reference to the accompanying drawings, in which:-

Figure 1 is a schematic view of one embodiment of a mine communication system according to the invention,

Figure 2 is a side view of one of the roof supports,

Figure 3 is a schematic view of another embodiment of a mine communication system according to the present invention,

Figure 4 is a schematic view of yet another embodiment of a mine communication system according to the invention, and

Figure 5 is a schematic view showing a modification to the system shown in Figure 4.

Referring firstly to Figure 1 of the drawings, the mine communication system shown therein comprises a control computer 10 for a plurality of mine roof supports 20 arranged along the working face of a mine, a plurality of control units 11 each associated with a respective roof support and at least one portable, hand

held, data unit 12 for use by an operator on the mine face.

One of the roof supports 20 is shown in Figure 2 and comprises a base 21, a canopy 22, a shield 23 pivotally connected to the canopy 22, a guide linkage, such as a lemniscate linkage 24, connecting the base 21 to the shield 23, props 25 for raising and lowering the canopy 22 relative to the base 21, and an advancing mechanism 26 for advancing the roof support 20 relative to a face conveyor 27, and for advancing the conveyor 27 relative to the roof support 20.

The control units 11 control and monitor all operations of the roof supports 20.

A base radio 13 having a radio signal transmitter and receiver is connected to the control computer 10 and the radio 13 communicates with a radio signal transmitter and receiver 16 in the data unit 12. The data unit 12 can receive information on the status of the roof supports 20 from the control computer 10 and can transmit information in the form of commands from the data unit 12 back to the control computer 10.

The base radio 13 has a loop aerial 14, typically 1 metre in diameter, which is preferably loosely coupled to the hydraulic hoses of the roof

supports 20 to aid propagation of the signal along the length of the mine face.

The data unit 12 has a similar loop aerial 15, typically sewn into a vest or harness worn by the operator.

Referring now to Figure 3 of the drawings, the mine communication system shown therein comprises a control computer 30 for a plurality of mine roof supports 20 arranged along the working face of a mine, a plurality of control units 31 each associated with a respective roof support 20 and at least one portable, hand held, data unit 32 for use by an operator on the mine face.

The data unit 32 has an infra red transmitter/receiver 33 and each of the control units 31 has an infra red transmitter/receiver 34 connected to the control computer 30 by wires. The data unit 32 can receive information on the status of the roof supports 20 from the control computer 30 by way of the infra red link between the data unit 32 and an adjacent control unit 31. The data unit 32 can transmit information in the form of commands back to the control computer 30 in similar manner.

Referring now to Figure 4 of the drawings,

the mine communication system shown therein comprises a control computer 40 for a plurality of mine roof supports 20 arranged along the working face of a mine, a plurality of control units 41 each associated with a respective roof support 20 and at least one portable, hand held, data unit 42 for use by an operator on the mine face.

A base radio 43 has a radio signal transmitter. The base radio 43 is connected to the control computer 40 and communicates with a radio signal receiver 44 in the data unit 42. This allows information on the status of the roof supports 20 to be transmitted to the data unit 42 from the control computer 40. The data unit 42 also has an infra red transmitter 45 and the control units 41 each have an infra red receiver 46 connected to the control computer 40 by wires. This allows an operator to transmit information in the form of commands from the data unit 42 to the control computer 40 by way of the infra red link between the data unit 42 and an adjacent control unit 41. This arrangement allows the size and power of the hand held data unit 42 to be minimised since data transmission over a short infra red link is much less power demanding than a longer range radio link. It also has the advantage that the aerial 47 associated with the data unit 42 can be much smaller than with the arrangement shown in Figure 1 as it serves only receive

radio signals.

This is believed to be the optimum arrangement since bi-directional infra red communication would require the operator's data unit 42 to be maintained in line-of-sight with one of the infra red transmitters/receivers of the control units and that is not always practical. In addition, dependency on outward transmission from the control computer by way of the control units on the roof supports may result in a loss of information if the roof support system registers a fault. By using radio signals as a means of outward transmission, the operator can always be kept informed of the support faults and retrieve information directly from the support computer as to where a fault lies.

A mineral winning machine, such as a shearer 50, movable along a face conveyor could be provided with a further data unit 51 in order to integrate the operations of the shearer 50 with the roof support system. The data unit 51 on the shearer could communicate with the control computer 40 by way of two way radio signals, or by way of bi-directional infra red signals between the shearer and an adjacent roof support control unit, or by way of a combination of radio and infra red signals.

When using radio signals to communicate between the control computer 40 and the shearer 50, transmission is best achieved by closely coupling toroidal aerials 52 and 53 of the base radio 43 and the further data unit 51 with the shearer cable 54 as shown in Figure 5.

Fully integrated systems employ a central computer to which the support control computer is linked. With the link in place it is possible to monitor, and if necessary control, all equipment connected to the central computer, including the roof supports themselves, the shearer and/or the data unit whether the communication link is by radio, infra red only or a combination of both.

Communication between the shearer and the control computer is shown in combination with the mine communication system of Figure 4, but it could also be used in combination with the communication systems of Figures 1 and 3.

Also, there could be a two way radio link between the control computer and the data unit(s) together with a bi-directional infra red link between the control units and the data unit(s) so that if one link fails the other link remains active.

CLAIMS

1. A mine communication system comprising a control computer for a plurality of mine roof supports, a plurality of control units each associated with a respective roof support, the control units being arranged so as to control and monitor the operations of the roof supports, at least one portable data unit for use by an operator on the mine face, means for transmitting information from the support control computer to the portable data unit and means for transmitting information from the portable data unit to the support control computer.

2. A mine communication system as claimed in Claim 1, further comprising a further data unit on the mineral winning machine, means for transmitting information from the support control computer to the further data unit and means for transmitting information from the further data unit to the support control computer.

3. A mine communication system as claimed in Claim 1 or 2, wherein the information is transmitted by radio link between the data unit and the control computer.

4. A mine communication system as claimed in any

preceding claim, wherein the information is transmitted by infra red transmission between the data unit and an adjacent control unit.

5. A mine communication system as claimed in Claims 3 and 4, wherein information is transmitted from the control computer to the data unit by radio link and from the data unit to the control computer by infra red transmission between the data unit and an adjacent roof support control unit which in turn passes the signal to the control computer.

6. A mine communication system as claimed in any preceding claim, which further comprises a central computer to which the support control computer is linked.

7. A mine communication system substantially as hereinbefore described with reference to the accompanying drawings.

Patents Act 1977
Examiner's report to the Comptroller under Section 17 (The Search Report)

Application number

GB 9207403.8

Relevant Technical fields

(i) UK Cl (Edition L) E1P

(ii) Int Cl (Edition 5) E21D

Search Examiner

D B PEPPER

Databases (see over)

(i) UK Patent Office

(ii)

Date of Search

2 APRIL 1993

Documents considered relevant following a search in respect of claims 1 TO 7

Category (see over)	Identity of document and relevant passages	Relevant to claim(s)
	NONE	

Category	Identity of document and relevant passages	Relevant to claim(s)

Categories of documents

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&: Member of the same patent family, corresponding document.

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